

NEW SPECIES OF CAVE DWELLING COCKROACHES IN THE GENUS  
*NEOTEMNOPTERYX* PRINCIS (BLATTARIA: BLATTELLIDAE: BLATTELLINAE)

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Three new cave dwelling species of the Australian endemic cockroach genus, *Neotemnopteryx* Princis (Blattellidae), are described. All three species, *N. braesensis*, *N. undarensis* and *N. baylissensis* were collected from basaltic larva tube cave systems in northern Queensland. A revised key to the 14 described *Neotemnopteryx* species is included. □ *Neotemnopteryx*, Blattaria, Blattellidae, Blattellinae, cockroaches, caves, subterranean, Queensland, Australia.

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Recent studies investigating the origin of Australian tropical cave cockroaches (Slaney, in press) have led to the discovery of three additional species of the cockroach genus *Neotemnopteryx* Princis, 1951 (Blattaria: Blattellidae: Blattellinae) in basaltic larva tube systems to the west of the Wet Tropics region of northern Queensland. One of them completely lacks eyes and ocelli. The genus contains 14 described species including the 3 in this paper, all of which are endemic to Australia (Roth, 1990, 1995). They occupy a variety of habitats including tropical rainforests of northern Queensland, woodlands of coastal Australia, semi-arid shrublands of the interior and caves in Queensland and Western Australia. Of the 14 described *Neotemnopteryx* species, 9 are surface dwelling species and 5 inhabit caves. The previously known cavernicolous species are *N. douglasi* (Princis, 1963), from limestone caves at Jurien Bay, WA, and *N. wynnei* Roth, 1995, from limestone caves on the Nullarbor plain, WA.

In this paper I describe the three new cavernicolous *Neotemnopteryx* species. In addition, a revised key to the 14 described *Neotemnopteryx* species is included. Further information on previously described species of *Neotemnopteryx* can be found in Roth's (1990) revision of this and closely related genera and in Roth (1995).

#### MATERIALS AND METHODS

Acronyms of repositories are: ANIC, Australian National Insect Collection, CSIRO, Canberra, ACT; MGC, M. Godwin Collection,

Department of Environment, Cairns, Queensland; QM, Queensland Museum, Brisbane, Queensland.

The male genitalia dissected from the type material include, if specialised, the seventh abdominal tergum. Genitalia were dissected and prepared from adult specimens by removing the end of the abdomen prior to maceration in 5-10% KOH. They were then cleared in Nesbitts fluid (Upton, 1991), consisting of 40g chloral hydrate in 25mL distilled water to which was added 2.5mL concentrated HCl. Lower concentrations of HCl could be used for slower clearing of delicate specimens. The genitalia were preserved in 80% ethanol and 5% glycerol, and stored in plastic genitalia vials with the type specimens. Genitalia were not slide mounted so as to avoid distortion and obscuring of important structures. In the descriptions I have followed, to a degree, the terminology used by Roth (1990) in his revision of the Australian Paracoblattini. Body dimensions were measured using a stereo-dissecting microscope and ocular micrometer, and are quoted in millimetres. Abbreviations: BL, total body length; PL, pronotum length; PW, pronotum width; EL, eye length; EW, eye width; AL, antenna length; TL, tegmen length; TW, tegmen width.

#### KEY TO MALES OF *NEOTEMNOPTERYX*

The following key is adapted from Roth's (1990) key and his figures are cited. *Neotemnopteryx fulva* appears in the key twice, since the seventh abdominal tergum may or may not be specialised (Roth, 1990).

1. Seventh abdominal tergum specialised (e.g. Fig. 1C) . . . 2  
Seventh abdominal tergum unspecialised . . . . . 8
2. Styles close together at apex of subgenital plate, left style more robust than right (fig. 13E in Roth, 1990) . . . . .  
. . . . . *N. styliparedra* Roth  
Styles not as above . . . . . 3
3. Posterior halves of lateral margins of pronotum straight, weakly oblique (figs 6A, 7A in Roth, 1990) . . . . . 4  
Posterior halves of lateral margins of pronotum not straight . . . . . 5
4. Supraanal plate subtrapezoidal; right style decidedly more robust than the left (fig. 6B,E in Roth, 1990) . . . . .  
. . . . . *N. australis* (Saussure)  
Supraanal plate tongue-shaped, with concave sides; right and left styles about the same size (fig. 7B-D in Roth, 1990) . . . . . *N. glossa* Roth
5. Hind margin of supraanal plate concavely excavated (fig. 10A in Roth, 1990) . . . . . *N. concava* Roth  
Hind margin of supraanal plate not concavely excavated 6
6. Right paraproct with U-shaped sclerotisation (Fig. 1D) 7  
Right paraproct without U-shaped sclerotisation (fig. 5B in Roth, 1990) . . . . . *N. gloriosa* Roth
7. Right style more robust than left; median genital phallomere with dark sclerotised claw-shaped apex and preapical projection (Fig. 1E) . . . *N. braesensis* sp. nov.  
Right and left styles similar; median genital phallomere without preapical projection (figs 1J, 2E,G in Roth, 1990) . . . . . *N. fulva* (Saussure)
8. Hind wings vestigial . . . . . 9  
Hind wings fully developed . . . . . 11
9. Eyes present . . . . . *N. douglasi* (Princis)  
Eyes absent . . . . . 10
10. Hind margin of supraanal plate with deep U-shaped indentation (Fig. 2D) . . . . . *N. baylissensis* sp. nov.  
Hind margin of supraanal plate convexly rounded (fig. 3A in Roth, 1995) . . . . . *N. wynnei* Roth
11. Hind margin of supraanal plate with deep U-shaped indentation (Fig. 1F) . . . . . *N. undarensis* sp. nov.  
Hind margin of supraanal plate without U-shaped indentation . . . . . 12
12. Pronotum elliptical, width about 1.5 times length (fig. 11A in Roth, 1990) . . . . . *N. elliptica* Roth  
Pronotum not elliptical . . . . . 13
13. Apex of median genital phallomere bifurcated (figs 8G, 9B in Roth, 1990) . . . . . *N. bifurcata* Roth  
Apex of median genital phallomere not bifurcated . . . 14
14. Right paraproct with U-shaped sclerotisation (Fig. 1D) . . . . . *N. fulva* (Saussure)  
Right paraproct without U-shaped sclerotisation (fig. 12B in Roth, 1990) . . . . . *N. nana* Roth

## SYSTEMATICS

BLATTARIA  
BLATTELLIDAE  
BLATTELLINAE  
PARCOBLATTINI

*Neotemnapteryx Princis* 1951*Neotemnapteryx braesensis* sp. nov.  
(Fig. 1A-E)

ETYMOLOGY. For the type locality, Black Braes lava tubes, about 270km west of Townsville.

MATERIAL. HOLOTYPE. QM T62986, ♂, BB-2 Cave, Black Braes lava tubes, 19°33'S 144°07'E, N Queensland, Australia, 9.v.1997, D.P. Slaney, D. Blair & F. Stone. PARATYPES. Same data as holotype, 2 ♂ (1 with dissected genitalia), 2 ♀, in ANIC, 1 ♂ with dissected genitalia, 2 ♀, in QM; 1 ♂, BB-7 Cave, other data as holotype, in QM. Females with ocelli lacking pigment: 1 ♀, BB-6 Cave, other data as holotype, in QM; 1 ♀, BB-7 Cave, other data as holotype, in ANIC.

DESCRIPTION. MALE. Yellowish brown. Pronotum subparabolic, widest just below middle (Fig. 1A). Eyes reduced, base of eyes reaching just below base of antennal socket. Antennae longer than body. Tegmina fully developed, reaching margin of supraanal plate. Hind wings fully developed, cubitus vein with 3 complete and 2-3 incomplete branches, apical triangle absent. Front femur Type A<sub>3</sub>, with anterior ventral margin with 4-5 large spines followed by row of smaller spines terminating in 3 large spines. Tarsal claws symmetrical, unspecialised, pulvilli absent, arolia small. First abdominal tergum with 2 dense fan-shaped groups of setae medially, and a few setae along anterior border partly covered by hind margin of mctanotum (Fig. 1B). Seventh abdominal tergum specialised with 2 dense groups of setae medially (Fig. 1C). Hind margin of supraanal plate deflexed (Fig. 1D). Intercercal ridge present, large, lined with numerous small dark spines, extending into genital chamber (Fig. 1D). Paraprocts asymmetrical, right larger, U-shaped with left half covered in short thick dark spines, left paraproct claw-like with few short fine setae (Fig. 1D). Subgenital plate and styles asymmetrical, extending beyond supraanal plate (Fig. 1E). Styles covered with short thick dark brown spines, right style larger, at apex of subgenital plate (Fig. 1E). Left phallomere hook-shaped with subapical incision, overlying large sclerotised plate with numerous small fine spines, median phallomere with dark sclerotised claw-shaped apex and preapical projection, right

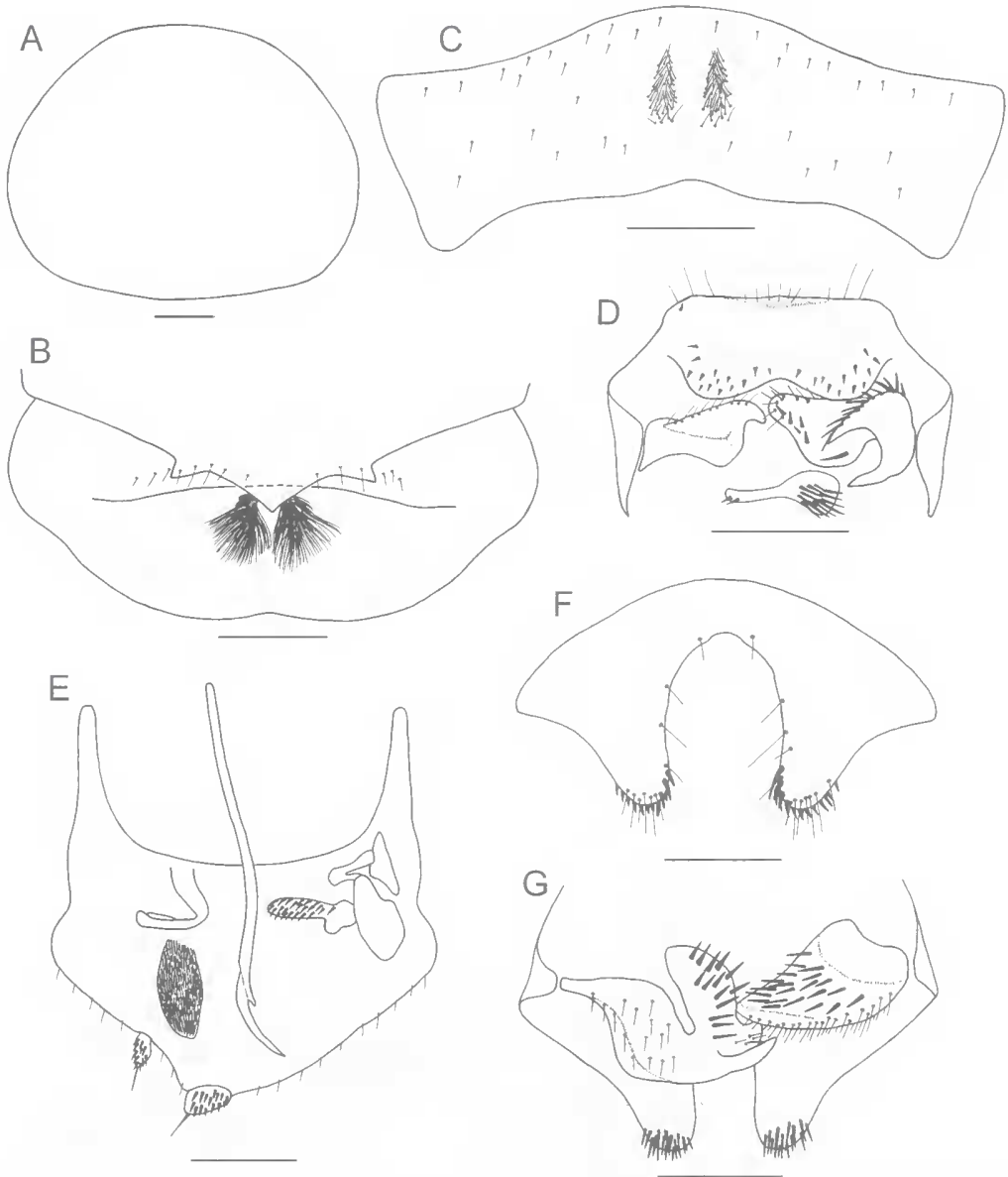


FIG. 1. A-E, *Neotemnopteryx braesensis* sp. nov., ♂. A, pronotum; B, setal gland on first abdominal tergum; C, setal gland on seventh abdominal tergum; D, supraanal plate and paraprocts (ventral view); E, subgenital plate, styles, and phallomeres (dorsal view). F-G, *N. undarensis* sp. nov., ♂. F, supraanal plate (dorsal view); G, supraanal plate and paraprocts (ventral view). Scale bars = 1mm.

phallomere with a cleft and elongated setose plate (Fig. 1E).

**Measurements.** Holotype first, paratypes in parentheses. BL: 17.2 (14.7-17.3); PL: 4.3 (3.8-4.7); PW: 5.8 (4.6-5.8); EL: 1.5 (1.7-1.9);

EW: 0.6 (0.5-0.6); AL: 25.0 (24.5-26.2); TL: 11.6 (10.2-12.5); TW 4.0 (3.6-4.2).

**FEMALE.** Larger than males. Eyes reduced, base of eyes level with base of antennal sockets.

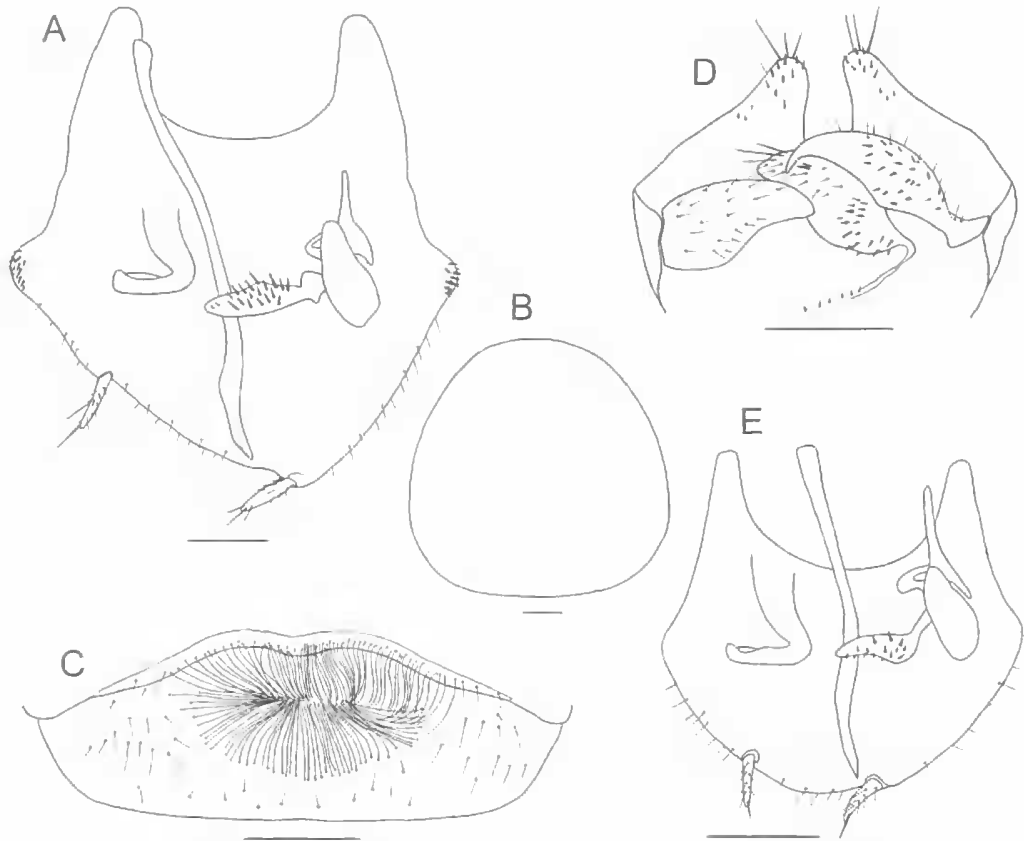


FIG. 2. A, *Neotemnopteryx undarensis* sp. nov., ♂. A, subgenital plate, styles, and phallomeres (dorsal view). B-E, *Neotemnopteryx baylissensis* sp. nov., ♂. B, pronotum; C, setal gland on first abdominal tergum; D, supraanal plate and paraprocts (ventral view); E, subgenital plate, styles, and phallomeres (dorsal view). Scale bars = 1mm.

Supraanal plate triginal. Subgenital plate broad, smoothly rounded. Females with ocelli lacking pigment similar to other females.

**Measurements.** Females with ocelli lacking pigment in parentheses. BL: 17.5-21.0 (17.2-19.1); PL: 4.2-4.8 (4.4-4.5); PW: 5.6-6.8 (5.5-5.6); EL: 0.9-1.2 (1.1-1.2); EW: 0.4-0.5 (0.5-0.6); TL: 12.9-16.7 (11.9-12.8); TW: 6.4-7.5 (3.6-4.0).

**REMARKS.** *Neotemnopteryx braesensis* is similar to *Neotemnopteryx fulva* (Saussure) but in *N. braesensis* males the median phallomere has a preapical projection. I consider *N. braesensis* females with unpigmented ocelli to be different morphs of the same species. Although females are larger than males, both female morphs have smaller eyes than males.

***Neotemnopteryx undarensis* sp. nov.**  
(Figs 1F,G, 2A)

**ETYMOLOGY.** For the type locality, Undara lava tubes, about 260km NW of Townsville.

**MATERIAL.** HOLOTYPE. QM T62987, ♂, Wishing Well Cave (U-52), Undara lava tubes, 18°06'S 144°40'E, N Queensland, Australia, 5.ii.1996, D.P. Slaney & E. Volschenk. PARATYPES. Same data as holotype, 1 ♂ with dissected genitalia, 2 ♀, 2 oöthecae, in ANIC, 1 ♂ with dissected genitalia, 2 ♀, 2 oöthecae, in QM. Same location as holotype, 1 ♀, 2 juv., 14.iv.1990, M. Godwin, MGC3399, 1 ♂, 4 juv., 24.x.1989, A. Little, MGC3635; Hot Hole Cave (U-51), Undara lava tubes, 18°07'S 144°40'E, 1 ♂, 1 juv., 13.x.1989, M. Godwin, MGC3308; Stevens Cave (U-16), Undara lava tubes, 18°15'S 144°43'E, 4 juv., 14.ix.1994, M. Godwin & G. Barnes, in MGC.

**DESCRIPTION. MALE.** Yellowish brown. Pronotum subparabolic, widest just below middle (as in Fig. 1A). Base of eyes extending well below base of antennal sockets. Antennae as long as body. Tegmina extending beyond abdomen. Hind wings fully developed, cubitus vein with 5-6 complete and 2-4 incomplete branches, apical triangle absent. Front femur Type A<sub>3</sub>, anterior ventral margin with 5-6 large spines followed by row of smaller spines, terminating in 3 large spines. Tarsal claws symmetrical, unspecialised, pulvilli and arolia present. First abdominal tergum with 2 dense groups of fan-shaped setae medially, and numerous setae along anterior border (as in Fig. 1B). Seventh abdominal tergum unspecialised. Supraanal plate with sides concave, hind margin with deep U-shaped excavation, forming pair of apically rounded lobes bearing long slender setae dorsally, densely covered with small dark spines ventrally (Fig. 1F). Intercercal ridge absent. Paraprocts asymmetrical, right with finger-like process, left with numerous short dark setae (Fig. 1G). Subgenital plate and styles asymmetrical (Fig. 2A). Sides of subgenital plate lobed bearing short thick spines (Fig. 2A). Styles similar, elongated, extending beyond margin of supraanal plate, covered with few long and short spines, right style pointing dorsally, left pointing ventrally (Fig. 2A). Left phallomere hook-shaped with subapical incision, median phallomere rod-like with shallow groove in apex, right phallomere with a cleft and elongated setose plate (Fig. 2A).

**Measurements.** Holotype first, paratypes in parentheses. BL: 26.1 (25.5-26.3); PL: 6.2 (6.0-6.4); PW: 7.7 (7.4-8.0); EL: 2.4 (2.2-2.5); EW: 1.3 (1.2-1.3); TL: 25.5 (23.4-26.0); TW: 7.6 (7.3-7.9).

**FEMALE.** Larger than males. Supraanal plate similar to male, but extending beyond margin of subgenital plate, with U-shaped excavation not as deep, and lobes lacking dark spines ventrally. Subgenital plate broad, smoothly rounded. Ootheca reddish brown, 7.5-9.8mm long, with 19-28 egg cells.

**Measurements.** BL: 26.8-27.5; PL: 7.0-7.5; PW: 8.6-9.1; TL: 25.2-27.3; TW: 7.3-8.0; EL: 2.3-2.7; EW: 1.3-1.4.

**REMARKS.** In males of *N. undarensis* the deep U-shaped excavation in the hind margin of the supraanal plate is similar to that of *Paratemnopteryx broomehillensis* Roth, 1990, and to that of *N. haylissensis* described below. However, in

*P. broomehillensis* the seventh abdominal tergum is specialised, and the subgenital plate and styles are symmetrical.

***Neotemnopteryx haylissensis* sp. nov.**  
(Fig. 2B-E)

*Paratemnopteryx* sp.4 Roth, 1990: 583-584.

**ETYMOLOGY.** For the location of the holotype, Bayliss Cave, which is part of the Undara lava tube system.

**MATERIAL. HOLOTYPE.** QM T62988, ♂, with dissected genitalia, Bayliss Cave (U-30), Undara lava tubes, 18°15'S 144°35'E, N Queensland, Australia, hand collected at banana bait, 3.ii.1995, D. Blair. **PARATYPES.** 1 ♀, same locality as holotype, 23.v.1985, F. Howarth, D. Irwin, and F. Stone, 1 ♀, 2 oothecae, 19.xi.1993, P. Weinstein, in QM; same locality as holotype, 1 ♀, 2 juv., hand collected at sweet potato bait, 23.iii.1997, F. Stone, in ANIC; 1 ♀, Kenny's Cave (U-40), Silent Hill Flow, Undara lava tubes, 18°13'S 144°41'E, 10.iv.1990, M. Godwit, MGC3398, in MGC.

**DESCRIPTION. MALE.** Pale yellowish brown. Pronotum subparabolic, widest near base (Fig. 2B). Ocelli and eyes absent. Antennae longer than body. Tegmina reduced, reaching T4. Hind wings vestigial, reaching top of T2. Front femur Type A<sub>3</sub>, anterior ventral margin with 5 large spines followed by row of smaller spines, terminating in 3 large spines. Tarsal claws symmetrical, unspecialised, pulvilli and arolia absent. First abdominal tergum with large medial depression containing dense group of setae, setae also present surrounding depression (Fig. 2C). Seventh abdominal tergum unspecialised. Supraanal plate with sides concave, hind margin with deep U-shaped excavation, forming pair of apically rounded lobes bearing small dark spines ventrally, and long thin spines at apex and dorsally (as in Fig. 1F). Intercercal ridge absent. Paraprocts asymmetrical, right with finger-like process, with few short dark spines, left paraproct claw-like (Fig. 2D). Subgenital plate and styles asymmetrical, extending beyond margin of supraanal plate (Fig. 2E). Styles similar, elongated, covered with few long and short spines (Fig. 2E). Left phallomere hook-shaped with subapical incision, median phallomere rod-like, apically acute, right phallomere with plate with short spines (Fig. 2E).

**Measurements.** Holotype, BL: 22.6; PL: 6.3; PW: 6.3; TL: 9.0; TW: 4.3.

**FEMALE.** Larger than males. Ocelli and eyes absent. Supraanal plate trigonal, lateral margins concave, apex shallowly indented. Subgenital plate broad, rounded, forming peak at apex.

Oötheca pale yellowish brown, 6.4-6.5mm long, with 9-10 egg cells.

*Measurements.* TL: 22.2-26.6; PL: 6.5-6.7; PW: 6.6-7.3; TL: 8.3-8.6; TW: 4.2-4.7.

**REMARKS.** Individuals of *N. baylissensis* lack ocelli and eyes. While collecting specimens of *N. baylissensis*, cockroaches were noted not to respond to the light from headlamps. Roth (1990) recorded a female individual of this species collected from Bayliss cave as a species of *Paratemnopteryx* (*P.* sp. 4), although he remarked that the habitus of the female resembled that of *Neotemnopteryx douglasi* (Princis). The U-shaped excavation in the hind margin of the supraanal plate of the male *N. baylissensis* specimen is similar to that of *N. undarensis* and *P. broomehillensis*, however, the asymmetrical subgenital plate and the habitus of the recently collected male specimen leads me to conclude that the specimens are a new species of *Neotemnopteryx*. In addition, aligned molecular sequence data obtained from the entire mitochondrial cytochrome oxidase II gene (COII) further support the inclusion of *N. baylissensis* in the genus *Neotemnopteryx* (Slaney, unpubl. data).

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#### LITERATURE CITED

- PRINCIS, K. 1951. Neue und wenig Bekannte Blattarien aus dem zoologischen Museum, Kopenhagen. Spolia Zoologischen Museum Hauniensis 12: 1-172.
- ROTH, L.M. 1990. A revision of the Australian Parco-blattini (Blattaria: Blattellidae: Blattellinae). *Memoirs of the Queensland Museum* 28: 531-596.
1995. New species and records of cockroaches from Western Australia (Blattaria). *Records of the Western Australian Museum* 17: 153-161.
- SLANEY, D.P. in press. New species of Australian cockroaches in the genus *Paratemnopteryx* Saussure (Blattaria, Blattellidae, Blattellinae), with implications for the evolution of tropical cave faunas. *Journal of Natural History*.
- UPTON, M.S. 1991. Methods for collecting, preserving, and studying insects and allied forms. The Australian Entomological Society miscellaneous publication No. 3, Brisbane.